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SRP EXPANSION AT VAL VISTA & WARNER AND **SEVERE INSTABILITY OF EXPANSIVE SOIL - MOISTURE CONTENT - RESULTANT SHRINK AND SWELL POTENTIAL**

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AZ CORP COMMISSION DOCKETED

AZ CORP COMMISSION DOCUMENT CONTROL

To: Dr. Christopher J. Labban
Mike Evans, Gilbert Town Council
Saretta L. Parro
Mark Sequeira
Dave Petersen

From: Bob Webb

APR 2 6 2001

Date: April 4, 2001

DOCKETED BY

As a reminder, I am a patient and friend of Dr. Labban. He introduced me to each of you last night and I showed you the following information. I have previously discussed with Dr. Labban the seriousness and severity of the expansive soil problem in Gilbert. This problem becomes critical relative to the proposed SRP expansion at Val Vista and Warner Road. The soil expands and contracts to a great degree as the water content is increased or as the soil dries out. The below information details the severity of the soil problem.

From the U. S. Department of Agriculture, Soil Conservation Service. Portions of the **SOIL SURVEY** EASTERN MARICOPA AND NORTHERN PINAL COUNTIES AREA, ARIZONA:

1. Map, USDA Sheet Number 25, showing types of soil from west of Cooper Road to east of Greenfield Road and north of Warner Road to south of Williams Field Road. This map includes the existing SRP plant and part of the proposed gas line west.
2. Pages 46 and 48, and so Table 6, Soil Survey, Interpretations of engineering/properties of soils
3. Page 51 (Item 2 above), with explanation of "Engineering interpretations of soils"

NOTE: Most of the soil within the SRP/SRP proposed expansion is of soil series Contine, and Vecont (Ve) shown on the map as "Co". Also note on Page 46 the "Degree and kind of limitation for--" and you will see that it reads Severe, Severe, Severe, Poor, and Unsuited underneath the column headings.

Page 51, second column, second paragraph: "Soil limitations are indicated by the ratings slight, moderate, and severe. Slight means... Moderate means... **Severe** means soil properties so unfavorable and so difficult to correct or overcome as to require major soil reclamation and special designs. (Paragraph 3:) Soil suitability is rated by the terms good, fair, and poor, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe."

I am going to try to obtain maps of the above for each of you and also the continuation of Page 51, being Page 52 and possibly more. If I am successful, you will find all of this information attached. If not, only the above information will be attached, including a photocopy of the map.

PROBLEM: Vecont soil, noted as Ve on the map, is also listed as **severe.** I was informed that the **EXPANSIVE SOIL** where I live (Vecont) was only 4%. A subsequent 52 page soil survey report states vecont soil can expand up to **18%**. A soil scientist advised me that it could be much more, with **expansive soil expansion up to 25% and maybe more.** Notice also that Mohall, noted on the map as Mo, Mv, is along the proposed pipeline and it is rated as follows: severe, moderate, moderate to severe, fair to poor and unsuited. All of the soil relative to the proposed SRP expansion presents a potential hazard to residents and schools.

Why do I tell you this? Expansive soil is a major problem. SRP is located on the worst of that type soil and so would the proposed new pipeline. This soil is so unstable, it not only could

but it **DOES PRESENT A POTENTIAL DANGEROUS PROBLEM TO ALL THE RESIDENTS, BUSINESSES, AND SCHOOLS IN THIS AREA.**

My wife and family moved here from Buffalo, New York in October 1998 after living there thirty five (35) years. I am well familiar with what happens when the ground freezes and heaves and the resultant damage that is done. Houses in Buffalo are built considering that problem. Houses here have not been built considering the **severe damage expansive soil can cause.** Builders are now beginning to utilize the necessary requirement: post-tension slabs. Thank God my house was built with a post-tension slab. I have had no problems but I know many people whose houses were built without post-tension and they have major, severe problems.

All of you are familiar with damage to hundreds of homes built in this area without post-tension slabs and as a result of the expansive soil problem. With the weight of houses, concrete slabs still crack, stem walls still crack, walls shift and crack, and on a long list continues. **WHAT KIND OF DAMAGE AND POTENTIAL DANGER CAN THIS SOIL DO TO A LARGE NATURAL GAS LINE? What about potential damage and disasters with those proposed three stacks, fifteen stories high?** I am against SRP's expansion in a residential-school area for many reasons. All parties who are against this need to be well aware of **potential for a major disaster occurring right here in Gilbert.**

SRP should not be permitted to expand in a large and continually expanding residential area. If they are, it is a disaster waiting to happen with the expansive soil problem. I quote newspaper articles and headlines from the following newspapers:

1. East Valley Tribune, Saturday, March 25, 2000: "Heavy rain, plumbing problems blamed for area's shifting soil (front page); from Page 4: SOIL: Hundreds of Valley homes crumbling on weak foundations".

2. Arizona Republic, Tuesday, January 18, 2000, front page: "Bad soil a menace in Valley." Note on Page A10: "Soil Map Online: www.aznrcs.usda.gov/soils/shrinkswell.html." This will give you an overall view of the problem but I was told this map is not as accurate as the USDA maps are. Please **read all of this article.**

3. Arizona Republic, Thursday, November 26, 1998: "Home-buyer homework pays off; Research can save a lot of heartache." Please read ALL of this article.

4. Arizona Republic, October 10, 1998: "Splitting headache for home builders". Page 1: "Maricopa County requires geological studies as a condition of development." Note especially page A18, column 1: "(a geological) phenomenon known to crack houses, break sewer lines and destroy wells. It's an unpredictable bomb ticking under parts of central and southern Arizona -- including Maricopa County -- that can cause millions of dollars in damage." It is the soil/earth that is causing the problem discussed in this article and is also related to the expansive soil problem, with contraction taking place as the soil dries out.

The Arizona Corporation Commission must certainly be made aware of the seriousness of the preceding noted problems and dangers.

Thank you.

Robert P. Webb

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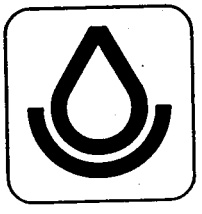
2533 East Estrella Street
Gilbert, Arizona 85296

SOIL SURVEY

Eastern Maricopa and Northern Pinal Counties Area, Arizona



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
ARIZONA AGRICULTURAL EXPERIMENT STATION
Issued November 1974

TABLE 6.—*Interpretations of*

Soil series, land types, and map symbols	Degree and kind of limitation for—			Suitability as a source of—	
	Septic tank absorption fields	Dwellings without basements	Local roads and streets	Road fill	Sand
Agualt: Af, Ag	Slight	Slight	Slight to moderate: A–2 and A–4.	Good to fair: A–2 or A–4.	Not suitable in upper 20 to 40 inches; ML. Poor below depth of 20 to 40 inches; SM; too many fines.
Alluvial land: Am.	Severe: variable material; hazard of ground water contamination.	Slight to moderate: variable material; short, steep slopes; contains fines.	Slight to moderate: variable material; contains fines.	Good in most places. Fair where excessive fines occur.	Good in most places. Fair where excessive fines occur.
Antho: AnA, AnB, AoB.	Slight	Slight	Slight	Good or fair: sandy loam and appreciable amount of fines.	Poor: mainly sandy loam.
Avondale: Av	Slight to moderate: moderate permeability.	Moderate: low to moderate shrink-swell potential.	Moderate: mainly A–4; low to moderate shrink-swell potential.	Fair: mainly A–4; low to moderate shrink-swell potential.	Not suitable: mainly very fine sandy loam and loam.
Carrizo: Ca, Cb	Slight: hazard of ground water contamination.	Slight	Slight	Good	Poor to depth of 13 inches. Good to fair below 13 inches; GP or GM.
Cashion: Cc	Slight	Severe: upper layer clay; high shrink-swell potential. Slight in sandy underlying layer.	Severe: upper layer clay; A–7. Moderate in sandy underlying layer; A–4.	Poor: A–7; high shrink-swell potential. Fair in underlying layer; A–4.	Not suitable: mainly clay and loam.
Cavelt: CeC	Severe: lime hardpan at depth of 5 to 20 inches.	Severe: lime hardpan at depth of 5 to 20 inches.	Severe: lime hardpan at depth of 5 to 20 inches.	Fair: A–4; hardpan at depth of 5 to 20 inches.	Not suitable: mainly loam; hardpan at depth of 5 to 20 inches.
Contine: Co	Severe: slow permeability.	Severe: high shrink-swell potential.	Severe: A–6 and A–7; high shrink-swell potential.	Poor: A–6 and A–7.	Unsuited: mainly fines.
Estrella: Es	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Moderate to severe: A–4 and A–6; moderate shrink-swell potential.	Fair to poor: A–4 and A–6.	Unsuited: loam and clay loam.
Gilman: Gf, Gm	Slight to moderate: moderate permeability.	Slight	Moderate to severe: A–4 and A–6.	Fair to poor: A–4 and A–6.	Unsuited: mainly loam.

TABLE 6.—*Interpretations of engineering*

Soil series, land types, and map symbols	Degree and kind of limitation for—			Suitability as a source of—	
	Septic tank absorption fields	Dwellings without basements	Local roads and streets	Road fill	Sand
Glenbar: Gn	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Severe: A–6; moderate shrink-swell potential.	Poor: A–6; moderate shrink-swell potential.	Unsuited: mainly clay loam.
Gravelly alluvial land: Gr.	Severe: variable material; hazard of ground water contamination.	Slight to moderate: material variable and contains fines; short, steep slopes.	Slight to moderate: material variable and contains fines.	Good: variable in content of fines.	Poor to fair: variable in content of fines.
Laveen: LaA, LaB, LeA.	Slight to moderate: moderate permeability.	Slight	Severe: A–4 and A–6.	Fair to poor: A–4 and A–6.	Unsuited: mainly loam.
Mohall: Mo, Mv	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Moderate to severe: A–4 and A–6; moderate shrink-swell potential.	Fair to poor: A–4 and A–6.	Unsuited: mainly clay loam.
Pimer: Pm	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Severe: A–6; moderate shrink-swell potential.	Poor: A–6	Unsuited: mainly clay loam.
Pinal: PnA, PnC	Severe: lime-silica hardpan at depth of 4 to 20 inches.	Severe: lime-silica hardpan at depth of 4 to 20 inches.	Severe: lime-silica hardpan at depth of 4 to 20 inches.	Fair: A–4; hardpan at depth of 4 to 20 inches.	Unsuited: loam and sandy loam; hardpan at depth of 4 to 20 inches.
Pinal, moderately deep variant: Po.	Severe: lime-silica hardpan at depth of 30 to 40 inches.	Moderate: lime-silica hardpan at depth of 30 to 40 inches.	Moderate: A–4; lime-silica hardpan at depth of 30 to 40 inches.	Fair: A–4	Unsuited: mainly loam.
Pinamt: PvA, PvC.	Severe: moderately slow permeability.	Slight	Slight	Good	Unsuited: mainly very gravelly sandy clay loam.
Rillito: RlA, RlB.	Slight to moderate: moderate permeability.	Slight	Slight to moderate: A–2 or A–4.	Fair to good: A–2 or A–4.	Unsuited: excessive fines.
Rock land: Ro	Severe: rock outcrop; shallow and very shallow soil.	Severe: rock outcrop; shallow and very shallow soil.	Severe: rock outcrop; shallow and very shallow soil.	Poor: rock outcrop; shallow and very shallow soil.	Unsuited: rock outcrop; shallow and very shallow soil.
Rough broken land: Ru.	Severe: soil variable and steep.	Severe: soil variable and steep.	Severe: soil variable and steep.	Poor: soil variable and steep.	Unsuited: soil variable and steep.
Tremant: TrB	Slight to moderate: moderate permeability below depth of 16 inches.	Slight	Slight to moderate: A–2 and A–4.	Good to fair: A–2 and A–4.	Poor: excessive fines.

TABLE 6.—*Interpretations of engineering*

Soil series, land types, and map symbols	Degree and kind of limitation for—			Suitability as a source of—	
	Septic tank absorption fields	Dwellings without basements	Local roads and streets	Road fill	Sand
Trix: Tx	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Severe: A–6; moderate shrink-swell potential.	Poor: A–6; moderate shrink-swell potential.	Unsuited: excessive fines.
Valencia: Va	Severe: moderately slow permeability.	Moderate: moderate shrink-swell potential.	Slight to moderate: A–2 and A–4.	Good to fair: A–2 and A–4.	Poor to unsuited: SM poor; SC unsuited; excessive fines.
Vecont: Ve	Severe: slow permeability.	Severe: high shrink-swell potential.	Severe: A–7; high shrink-swell potential.	Poor: A–7; high shrink-swell potential.	Unsuited: clay
Vint: Vf	Slight: hazard of ground water contamination.	Slight	Slight	Good	Poor: excessive fines.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from the plastic state to a liquid. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range in moisture content within which a soil material is in a plastic condition.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 5. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

Hydrologic soil groups are used to estimate runoff from rainfall. Soil properties are considered that influence the minimum rate of infiltration obtained for a bare soil after prolonged wetting. These properties are depth to a seasonal high water table, intake rate, permeability after prolonged wetting, and depth to a very slowly permeable layer. The influence of ground cover is treated independently—not in hydrologic soil groupings. The soils have been classified into four hydrologic groups, A through D.

Soils in group A have low runoff potential and have a high (rapid) infiltration rate, even when thoroughly wetted. They consist chiefly of deep, well drained to excessively drained sand or gravel. These soils have a high rate of water transmission.

Soils in group B have moderately low runoff potential and have a moderate infiltration rate when thoroughly wetted. They consist chiefly of moderately deep and deep, moderately well drained and well drained soils that have moderately fine to moderately coarse texture and moderately slow to moderately rapid permeability. These soils have a moderate rate of water transmission.

Soils in group C have moderately high runoff potential and have a slow infiltration rate when thoroughly wetted. They consist chiefly of soils that contain a layer that impedes downward movement of water, that have a moderately fine or fine texture, that have a slow infiltration rate because of salts or alkali, or that have a moderate water table. These soils may be somewhat poorly drained or they may be well drained or moderately well drained, and they contain a slowly or very slowly permeable layer (fragipan, hardpan, hard bedrock, and the like) at a depth of 20 to 40 inches.

Soils in group D have high runoff potential and have a very slow infiltration rate when thoroughly wetted. They consist chiefly of clay soils that have a high swelling potential; of soils that have a permanently high water table, a claypan or clay layer at or near the surface, and a very slow infiltration rate because of salts or alkali; and of soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Permeability refers to the rate at which water moves through the soil material. It depends largely on the texture and structure of the soil and is estimated for uncompacted soil.

Available water capacity is the amount of water a

properties of soils—Continued

Suitability as a source of—Continued		Soil features affecting—		
Topsoil	Gravel	Pond reservoir areas	Embankments, dikes, and levees	Irrigation
Fair: clay loam	Unsuited: excessive fines.	Moderately slow permeability.	Medium to low shear strength; medium to low susceptibility to piping; medium compressibility; low compacted permeability; fair to good compaction.	High available water capacity; moderately slow permeability.
Good	Unsuited: SM and SC; excessive fines and low content of gravel.	Moderately slow permeability to depth of 45 inches.	Medium shear strength; low to medium compressibility; low to medium compacted permeability; medium susceptibility to piping; fair to good compaction.	High available water capacity; moderately slow permeability; moderately rapid intake rate.
Poor: clay	Unsuited: clay	Slow permeability	Low shear strength; low compacted permeability; low susceptibility to piping; fair to good compaction; high compressibility.	High available water capacity; slow permeability; slow intake rate.
Poor: loamy sand and fine sand.	Unsuited: low content of gravel.	Moderately rapid permeability.	Medium shear strength; low to medium compressibility; low to medium compacted permeability; medium to high susceptibility to piping; fair to good compaction.	Moderately low available water capacity; moderately rapid permeability.

soil can hold available for plants. It is the water held in the range between field capacity and wilting point.

Shrink-swell potential is that quality of a soil that determines its volume change with changes in moisture content. It is estimated primarily on the basis of the amount and kind of clay in the soil.

Corrosivity refers to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties, such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Soil reaction, or pH value, of the soils in the survey area is not shown in table 5, because all the soils have similar reaction. The pH value of most of the soils ranges from 7.9 to 8.4, which is considered moderately alkaline. This degree of alkalinity does not adversely affect the commonly grown crops.

Engineering interpretations of soils

The estimated interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Maricopa and Pinal Counties. In table 6 ratings are used to summarize limitation or suitability of the soils for all specified purposes other than for pond reservoir areas; embankments, dikes, and levees; and irrigation. For these particular uses, table 6 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties generally favorable for the rated use, or in other words, limitations that are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties so unfavorable and so difficult to correct or overcome as to require major soil reclamation and special designs.

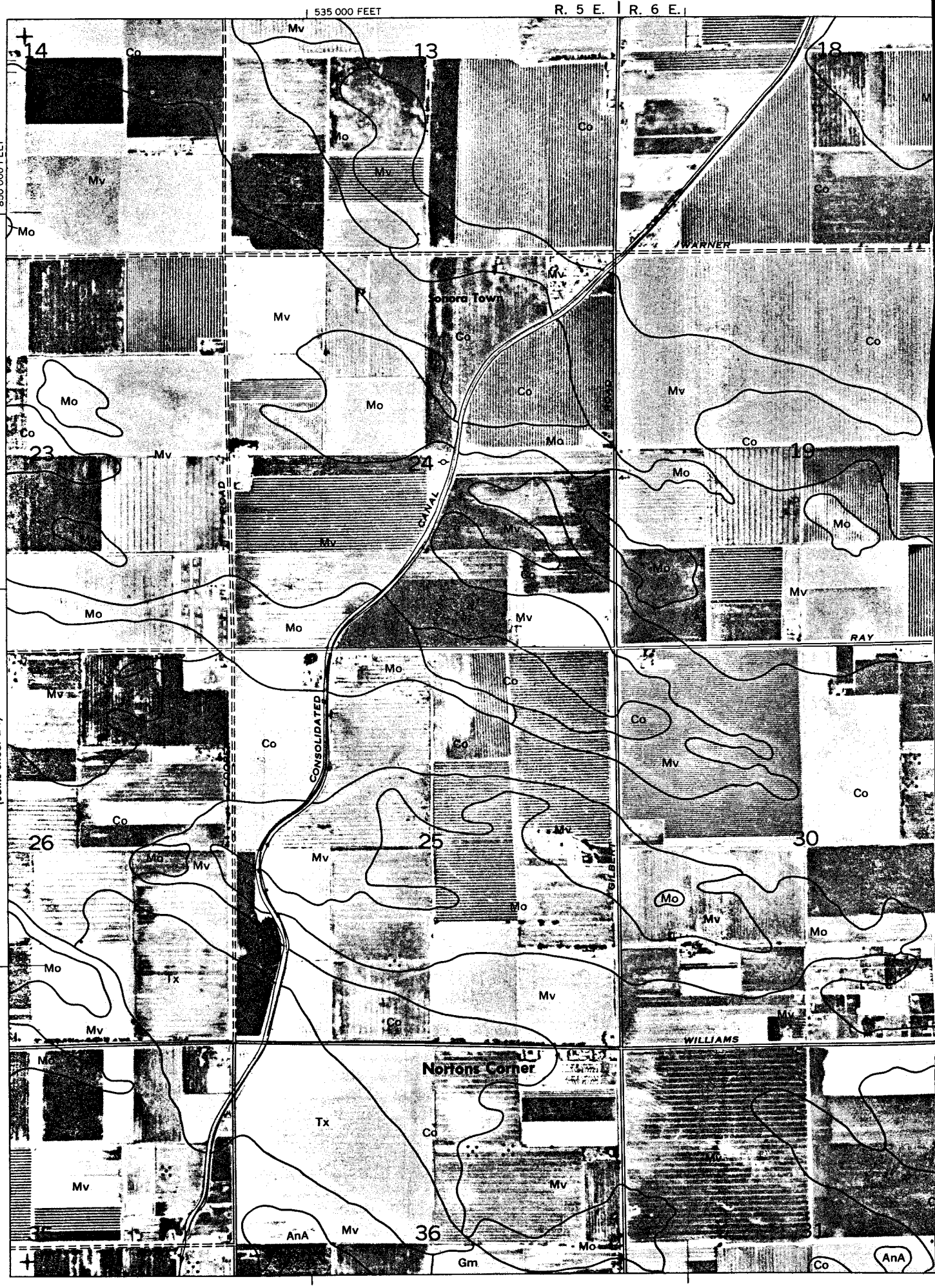
Soil suitability is rated by the terms *good*, *fair*, and *poor*, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 6.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Dwellings, as rated in table 6, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support a load and resist settlement under a

EASTERN MARICOPA AND NORTHERN PINAL COUNTIES AREA, ARIZONA NO. 25



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Arizona Agricultural Experiment Station. Photobase from 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Arizona coordinate system, central zone.

Land division corners are approximately positioned on this map.

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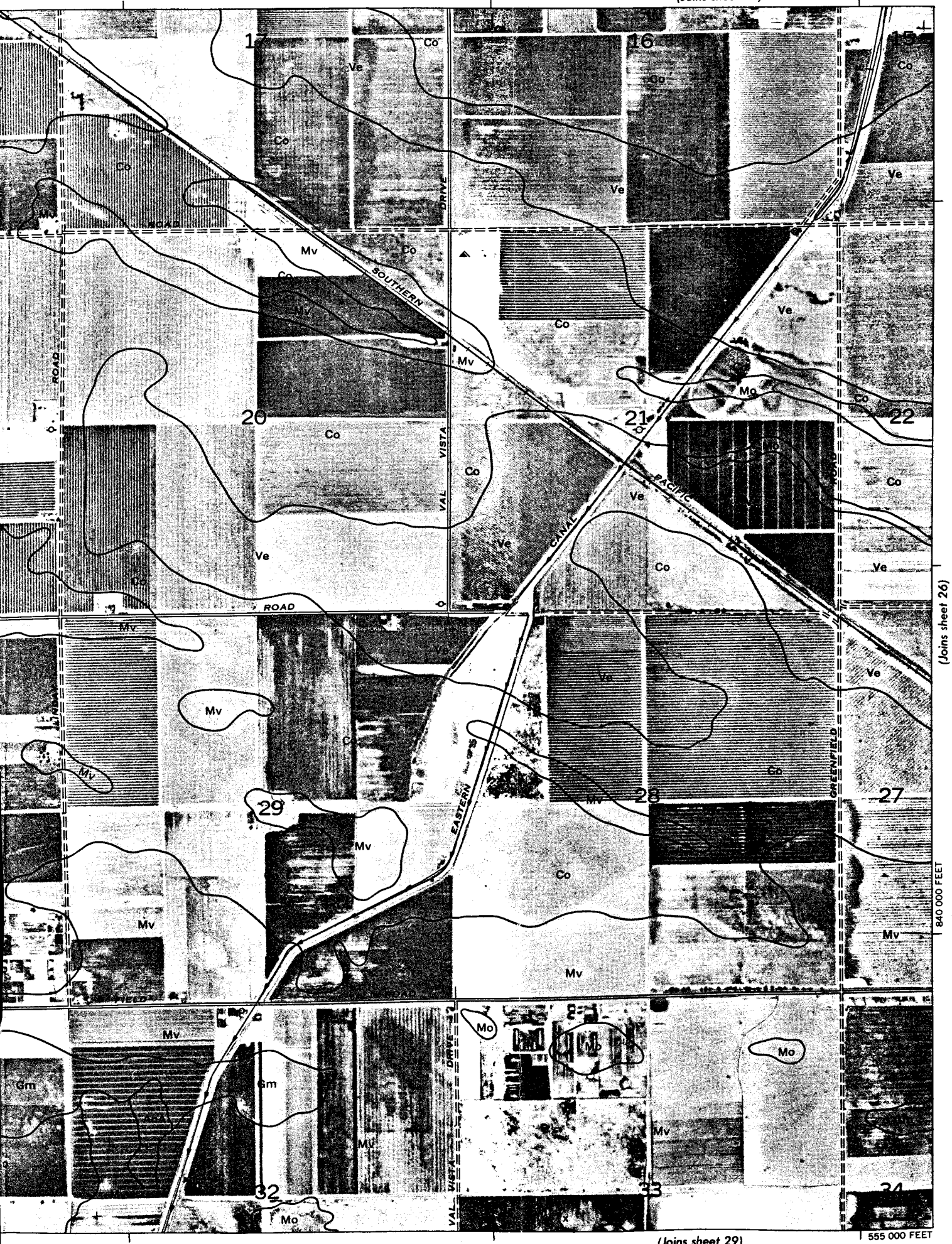

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1 Mile

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Scale 1:20 000

ORIGINAL

PINNACLE WEST
CAPITAL CORPORATION

William J. Post
Chairman of the Board &
Chief Executive Officer

April 26, 2001

Mr. Richard Silverman
General Manager
Salt River Project
P. O. Box 52025
Phoenix, AZ 85072

Dear Dick:

I understand that in public comments to the Arizona Corporation Commission ("Commission") yesterday, several opponents of Salt River Project's Santan Power Plant Expansion Project have referred to statements made by me and have suggested that these statements show that the Santan Power Plant expansion is not needed. Their interpretation of my comments is incorrect.

I have said, and do believe, that excluding unforeseen or unusual situations there are sufficient power resources available, through either generation or transmission, to meet the needs of APS' customers this summer. I have not made any statements suggesting that the Santan Power Plant is not needed by SRP in the timeframe for which it is planned. In fact, I believe the generation expansion is necessary to meet eastern valley loads.

In presentations and workshops at the Commission and before the Arizona Power Plant and Transmission Line Siting Committee, APS, SRP, and the other Arizona electric utilities have testified about the need for additional generation and transmission resources to serve our growing communities. In fact, both APS and SRP work closely together to meet the electric power needs of the Valley in a reliable, cost-effective, and environmentally-responsible manner.

Sincerely,

WJP:lr